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MEDICINE, AND CLINICAL PROFESSOR OF DISEASES OF THE SKIN IN THE
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FAT is an essential constituent of the skin. It is present between the meshes of the white fibrous and yellow elastic tissue of which the corium is composed, and is the main element of the secretion of the sebaceous glands. Sebum consists of fat-cells and free fat mixed with epithelial detritus. Analysis shows that sebum contains 40 per cent. of palmitin and olein and 35 per cent. of water, together with casein, gelatin, and a small quantity of sodium chlorid, sodium phosphate, and sodium sulphate. These facts of anatomy and chemistry demonstrate that fatty material is necessary to the nutrition of the integument. The close relationship between the sebaceous ducts and the hair-follicles suggests that the secretion contributes to the nourishment of the hair-bulb and shaft. The fatty material preserves the epiderm from maceration by profuse perspiration, counteracts the effect of irritant discharges upon the outlets of the body, and lessens friction between opposing surfaces. It also protects the surface against variations of temperature. Sebum may, therefore, be justly regarded as the prototype of an unguent.

When, as the result of local or general disease, or from the gradual wasting of tissue which takes place in old age, the nutrition of the skin is impaired, we are able by inunction to restore the nutrient material of which the integument stands in need. The hair and nails suffer or improve with the surface of which they form a part and from which they spring. The intelligent application of an ointment is, consequently, beneficial to the appendages as well as to the integument.

Abnormal surface-heat is reduced by the topical application of fat. This property was pointed out by Professor Senator, of Berlin, and corroborated by the exact thermometric observations of Dr. Colrat, of Lyons. Dr. Colrat found that lard, cerate, and vaselin, when spread upon the skin, had the power of reducing not only the local, but also the general temperature. About an hour after the fat was applied the temperature had fallen from 1.4° to 3.6° F. Two hours later the temperature had ascended to the starting-point, and the unguent was again needed.

Turgescence of the cutaneous capillaries generally gives rise to that peculiar and often very distressing disturbance of sensation known as itching. This symptom is an attendant upon most diseases of the skin. It probably depends upon a modification of the terminal fibrillæ of sensory nerves, produced by moderate pressure, as in local hyperemias; by the development of nodules, as in urticaria and prurigo, or by some alteration in the quality of the blood. The action of fat in abstracting heat and in alleviating pruritus explains the usefulness of its application

in the eruptive fevers of childhood, more especially in measles and scarlet fever. The effect of this simple procedure is often so marked that little patients will ask to be greased, after they have experienced the relief to which it gave rise. The commoner forms of fat found in every household—bacon-fat, lard, suet, butter—answer the purpose, though cold cream is equally efficient and is a more acceptable application.

Fat is useful in protecting the surface from the effect of discharges poured out from some natural outlet or seat of disease. The fluids of eczema are sometimes highly irritant and serve to extend the disease over a wider surface. Acrid secretions from the vagina and intestinal canal very commonly excite diseased action in the skin over which they pour. Incontinence of urine in children or the dribbling of urine in cases of old stricture, urinary fistulæ, enlarged prostate, and paralysis of the bladder, also lead to inflammation. In all of these conditions, if the origin of the difficulty cannot be removed, the greasing of the surface will, at least, sensibly diminish the cutaneous irritation.

An ointment is beneficial in the desquamative stage of scarlatina by preventing a wide dispersal of the scales, and, to this extent, it exerts a certain prophylactic influence.

Medicinal ointments almost invariably consist of one or more remedial agents incorporated in a fatty substance. In consideration, however, of the important properties possessed by fats or oils, as such, independently of the drugs which may be added to them, it is obvious that the fat itself, the base, the

vehicle, or excipient of the ointment, is by no means a factor of indifference.

Fats are derived from either the animal or vegetable kingdom of nature. Those from the former source are generally solid, and those from the latter are usually fluid. No wide difference of chemical composition accompanies this variation in physical form. Most of the animal or vegetable fats or oils may be used in the preparation of ointments, though some of the vegetable oils are of too irritant a character to be used in full strength and, when used, must be regarded in the light of medicated ointments. In this capacity some have proved useful in certain obstinate affections of the skin.

The substances ordinarily used as ointment-bases are lard, suet, petroleum-jelly, and lanolin. To this list may be added butter, spermaceti, cacao-butter, and the glycerite of starch. Whichever is chosen should be used only in a pure state. Fats and oils, as is well known, are peculiarly prone to undergo decomposition when exposed to the air, becoming converted from neutral into acid bodies. The fatty acids produced during the alteration are not only offensive to the sense of smell, but are also decidedly deleterious to the skin. Petroleum-jelly, though of mineral origin, belongs among the fats by virtue of its chemical constitution, and possesses the excellent quality of resisting chemical change for an indefinite period. This, together with its pleasant appearance, its freedom from odor, and its consistence, has caused it to be very widely used as an ointment-base. It is, however, not free from objections. Although it does not readily undergo de-

composition, yet from its mode of manufacture from so highly complex a fluid as petroleum, it is liable to be contaminated with irritant substances which unfit it for service as an ointment-base or simple ointment. Again, its unabsorbability is in many, if not in most, instances an argument against the use of petrolatum.

Much debate and fluctuation or contrariety of opinion has existed as to whether alkaloids, salts, and other medicinal substances dissolved in fluids or thoroughly incorporated in a fat could be absorbed into and through the skin. That animal fat can penetrate the skin has been indisputably proven by a number of clinical and experimental observations. Cachectic children often gain in weight and strength under a course of inunction of cod-liver oil. That, applied to the skin, alkaloids can be carried into the circulation by the fat with which they are mixed is demonstrated by the occurrence of physiologic effects. That salts may be conveyed into the economy in the same manner is shown by their subsequent appearance in the urine, as recognized by the proper tests. The subject of cutaneous absorption has recently been studied by Dr. Leon Kopff, of Krynica. His conclusions as regards ointments are thus expressed: "Salts applied to the integument in the form of ointments reach the organism and may be recognized in the excretions. The quantity absorbed in this manner seems to be very little, but it is considerably larger, comparatively, than that taken up from watery or alcoholic solutions. It follows, therefore, that the absorptive capacity of the skin for salts, applied in the form of

ointments, is relatively high. Just as is the case with watery and alcoholic solutions, different salts rubbed up with ointments are absorbed in different proportions."

Lard is one of the oldest and one of the best excipients, and is the basis of most of the officinal ointments. It is readily absorbed, but is open to the disadvantage that it rapidly undergoes alteration. This tendency to decomposition, however, can be easily overcome by the addition of benzoin or a small quantity of beta-naphthol. Lard contains a large proportion of olein, which, being of fluid consistence, is in a fit state for absorption. Suet also forms a good basis. It is firmer than lard, as it consists of a preponderance of stearin and palmitin, with a much lower proportion of olein than is present in lard. Its greater stiffness will sometimes cause suet to be preferred to lard, and, in other instances, the two may be used in conjunction. Suet, on the other hand, in consequence of its chemical composition, does not penetrate the skin as rapidly as lard.

Animal fats are capable of passing into the organism by way of the skin, and influencing local, or even general, nutrition. The same statement may be made concerning the vegetable oils sometimes employed in preparing ointments, as, for instance, olive oil. Vegetable oils, whether taken into the system by the mouth, by subcutaneous injection, or by absorption through the skin, are converted into animal oils and thus may form a constituent portion of the body. This is not the case with petroleum fat. Petroleum, vaselin, cosmolin, or by what-

ever name it is known, is an unabsorbable substance, which has no affinity for animal tissues. It is insoluble in the animal fluids, and when taken by the mouth it passes through the alimentary canal without change of state, and, consequently, without absorption. It is not converted into animal fat when thrown beneath the skin. It is not capable of passing through the integument. Its function, therefore, as an external medicament must be restricted to a superficial action upon the epiderm, abraded or ulcerated surfaces.

The sole conspicuous merit possessed by petrolatum, viz., stability of composition, is shared by an excipient introduced in 1886, by Professor Liebreich, of Berlin. I refer, of course, to lanolin, which, as now made by improved processes, is a white unctuous substance almost entirely devoid of odor. The scarcely perceptible scent which may still adhere to it can be effectually disguised by the addition of some agreeable perfume, as, for instance, a few drops of oil of bergamot, neroli, or rose. It is thus rendered so agreeable as to be a pleasant toilet article. Lanolin is, in fact, fitted, by several of its properties, to be used as a cosmetic application.

Being itself a derivative of horny tissue, we should naturally expect that lanolin would be easily absorbed by the epiderm and the glandular follicles, which are lined with young epithelial cells belonging to the same layer. This inference from its origin is justified by experience. Lanolin rapidly disappears when rubbed into the skin, and narcotic extracts incorporated with lanolin produce their char-

acteristic effects when applied externally in twice the dose which is efficient by the mouth. Lanolin is peculiar in its power of absorbing water, of which it can take up more than twice its own bulk. In this quality it far exceeds all other ointment-bases. It has been shown by Unna, also, that the more water a fat is capable of absorbing, the more readily that fat itself is absorbed into the skin. Lanolin combines without difficulty with other oils, fats, and glycerin.

Lanolin is an aseptic substance. It is impermeable by microorganisms. This valuable triad of qualities—aseptic nature, unalterability, and easy absorbability—renders lanolin of decided importance in a wide range of disease-conditions as a medicament in itself and not merely as an excipient.

It has been found that lanolin is extremely effective in extinguishing mercury. Equal parts of lanolin and metallic mercury can be intimately mixed within ten minutes, and after trituration for half an hour no mercury can be detected by aid of the lens. For this reason the last edition of the Austrian Pharmacopeia directs that lanolin be used in the preparation of mercurial ointment.

Spermaceti is sometimes added to lard in order to render the unguent of firmer consistence. Spermaceti is of neutral reaction and bland taste, and, when pure, is an unobjectionable ingredient. It, however, rapidly becomes rancid upon exposure to the air. Cacao-butter is a pleasant substance to the taste and smell and of a neutral reaction. Like spermaceti, however, it is of unstable composition.

Practically, therefore, our choice of an ointment-

base¹ is, in the vast majority of cases, narrowed down to lard and lanolin. Lard is often advantageously rendered firmer by the addition of suet or wax, while the slight stickiness belonging to lanolin can be overcome by mixing 65 parts of anhydrous lanolin with 30 parts of liquid paraffin and 5 parts of cerasin, as originally proposed by Mr. Helbing.

I have mentioned the chief qualities which fat possesses in the treatment of diseases of the skin. The base constitutes the principal part of any ointment by weight and bulk, though its medicinal action is, in many instances, only of a subsidiary character. But there are many important pathologic conditions in which the fat, the ointment-base itself, is of more consequence than the drug or drugs which it may contain. One class of these I have already mentioned and need not repeat, viz., the eruptive fevers. Pain, heat, and itching in simple erythema, erythema nodosum, superficial burns, acute eczema and erysipelas, are relieved by inunction. If any medicinal substance be added to the base, it must be of the blandest character, such as bismuth, lead, zinc, or cucumber juice. Lard is emollient and, as a rule, is preferable to lanolin in acute eczema, as the disordered type of nutrition expressed by the local disease may be heightened by the application of a substance that tends to increase nutritive action. On the other hand, its

¹ For further observation on ointments, see author's work on *Ointments and Oleates, especially in Diseases of the Skin*. F. A. Davis Co., Philadelphia, 1890.

aseptic nature peculiarly qualifies lanolin to serve as an ointment-base in cases of erysipelas.

In the foregoing, in conformity with the title of my paper, I have confined my observations to the ointment-bases themselves, or, in other words, to simple ointments. To consider fat as a vehicle for substances of varied properties, employed for various purposes, would lead me far beyond the limits of my subject. It would, in fact, be tantamount to a review of the whole topic of local therapy by means of ointments. I will, therefore, content myself with an enumeration of the various uses to which medicated ointments may be put. They may be employed for the purpose of stimulating granulation and reparative action in ulcers due to traumatism, varicose veins, scrofula, lupus, etc. Ingredients of more or less stimulating character are here required in accordance with the nature and chronicity of the case. In these conditions petroleum jelly may be serviceably used, as what we desire is a direct action upon the circulation, nervous influence and nutrition of the part involved, and not a deeply penetrative action.

A more intense degree of activity may be utilized for the destruction of small benign tumors of the skin, and of nodules, as warts, venereal growths, lupus, etc. Such applications, likewise, are sometimes of benefit in superficial epitheliomatous ulcers.

Medicated ointments are applied with benefit to modify the capillary circulation of the skin, as in hyperidrosis, seborrhea, acne, rosacea, alopecia,

psoriasis, etc. In most of these cases a penetrating excipient, as lard or lanolin, is to be preferred. In psoriasis there is no objection to the use of petrolatum, as our object is to act upon the hypertrophied papillæ and the infiltrated superficial layer of the corium.

Ointments may be used, on account of their influence upon cutaneous nerves, in urticaria, hyperesthesia of the skin, dermatalgia, paresthesia, prurigo, etc. A base which can pierce the epidermic layer and bring the medicament into contact with the nerve-endings should have preference.

The nutrition of the skin and its appendages, as in ichthyosis, senile atrophy of the skin, scleroderma, atrophy of the hair, etc., is promoted by inunction with lanolin, associated or not with other remedial substances.

In the treatment of parasitic diseases of the skin, such as scabies, tinea versicolor, favus, trichophytosis, we need a base which is capable of carrying the parasiticide into the interstices of the epithelial layer and into the glandular follicles.

According to Unna, fat spread upon the skin has an effect upon the circulation through the kidneys by diminishing evaporation from the skin.

A simple ointment-base, such as lard, lanolin, or olive oil, is of material assistance in softening and loosening crusts, scales, and scabs, and in exposing the affected surface to the action of appropriate remedies.

A layer of fat upon the skin prevents atmospheric contact and diminishes the danger of bacterial in-

fection. Inunction with cod-liver oil improves systemic nutrition in rickets, scrofula, chronic dysentery, and tuberculosis. Lanolin enhances the activity of chrysophanic acid, naphthol, salicylic acid, pyrogallol, and resorcin.

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